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# *OurOcean*

## A web portal to serve near real-time coastal ocean data products

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## Outline



- Motivation
- *OurOcean* Architecture
- Current *OurOcean* Data Products
- *OurOcean* User Interface
- *OurOcean* Data Server
- *OurOcean* Visualization Tools
- Status & Future Direction

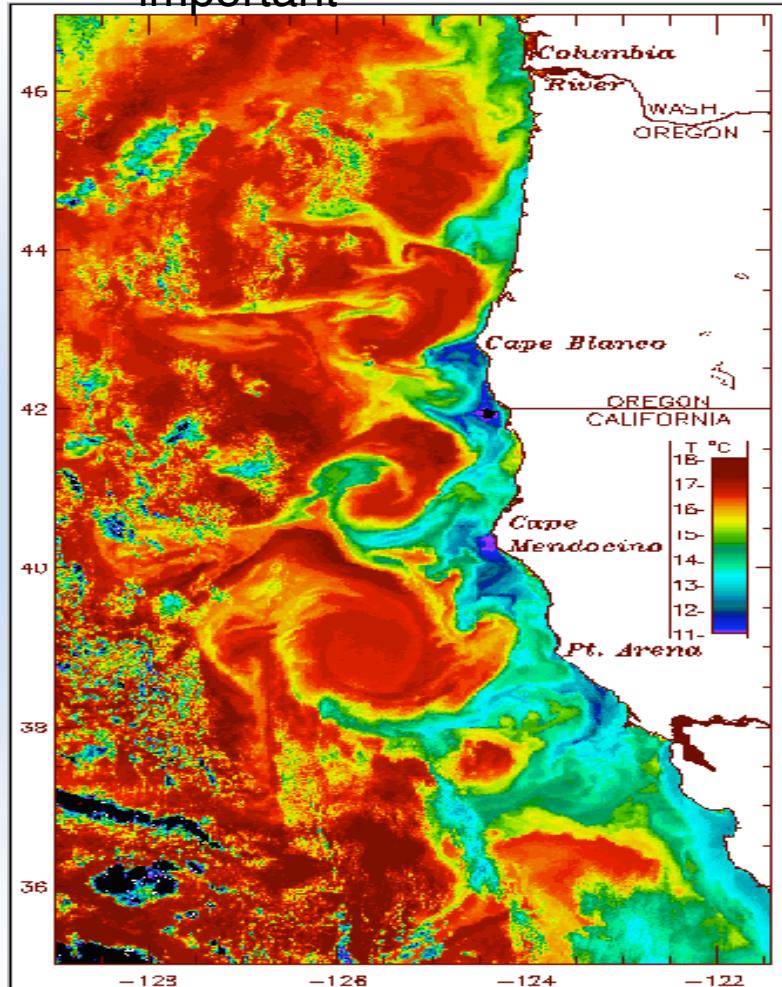


## Motivation

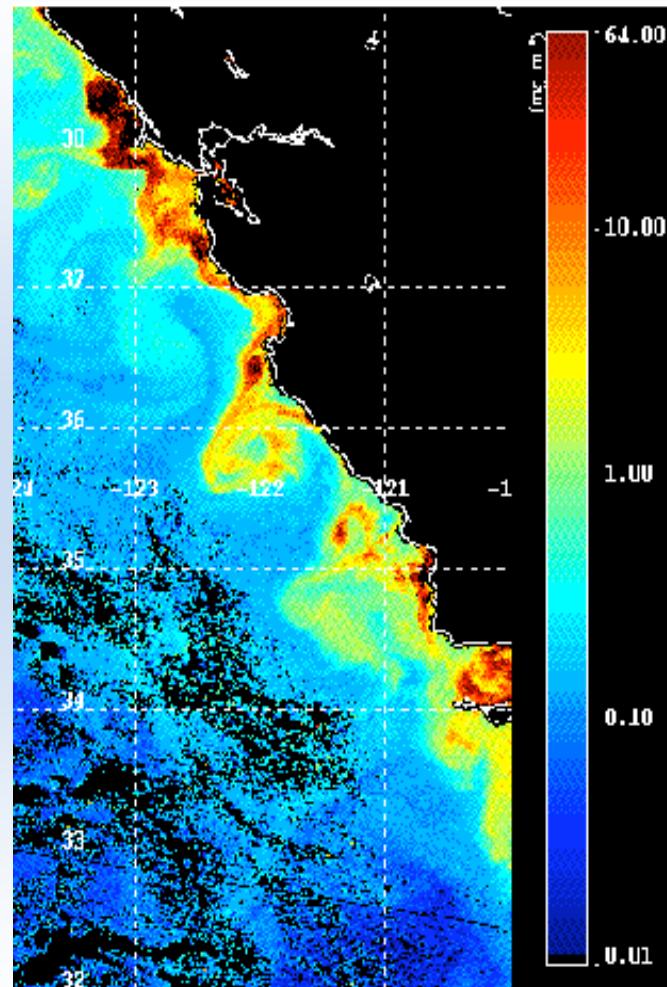


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Coastal Oceans are scientifically interesting and practically important



Sea Surface Temperature



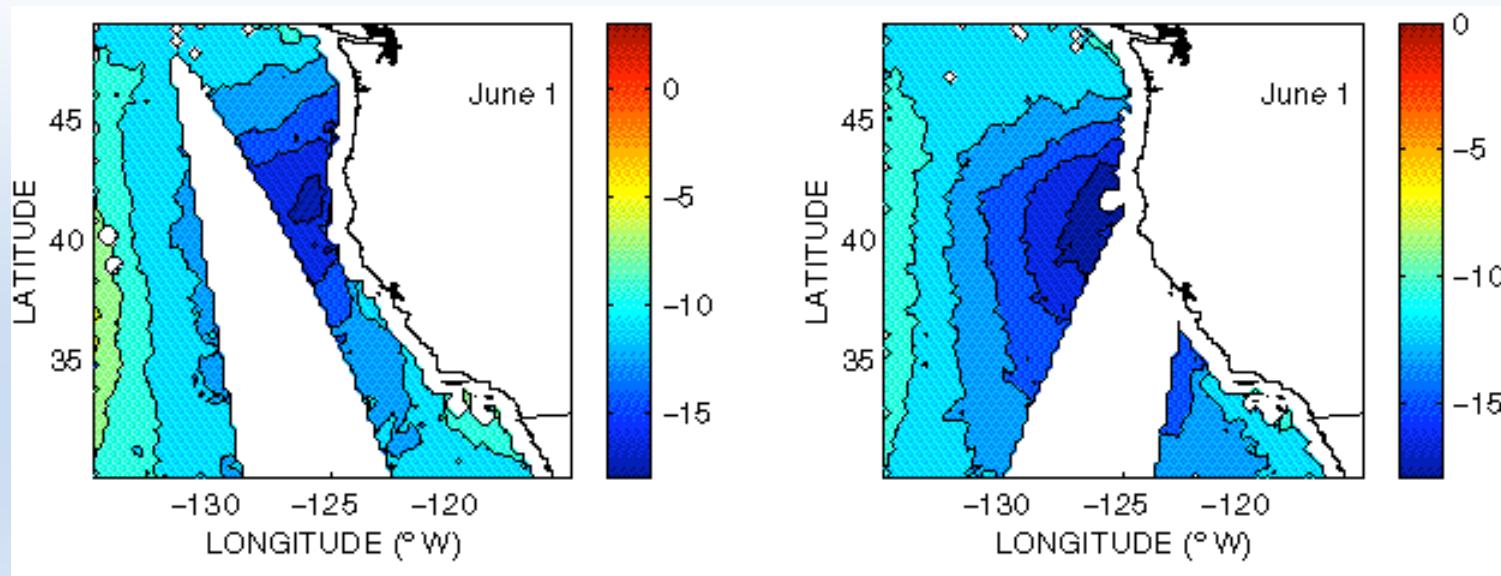
Ocean Color



## QuikSCAT Coastal Winds



Satellite data alone does not provide enough and accurate information at the coastal regions



- Ocean data have gaps between satellite tracks
- Satellite data are contaminated near coastlines (by land)
- A high resolution (1-10 km) regional atmosphere model is required to fill the satellite data gaps

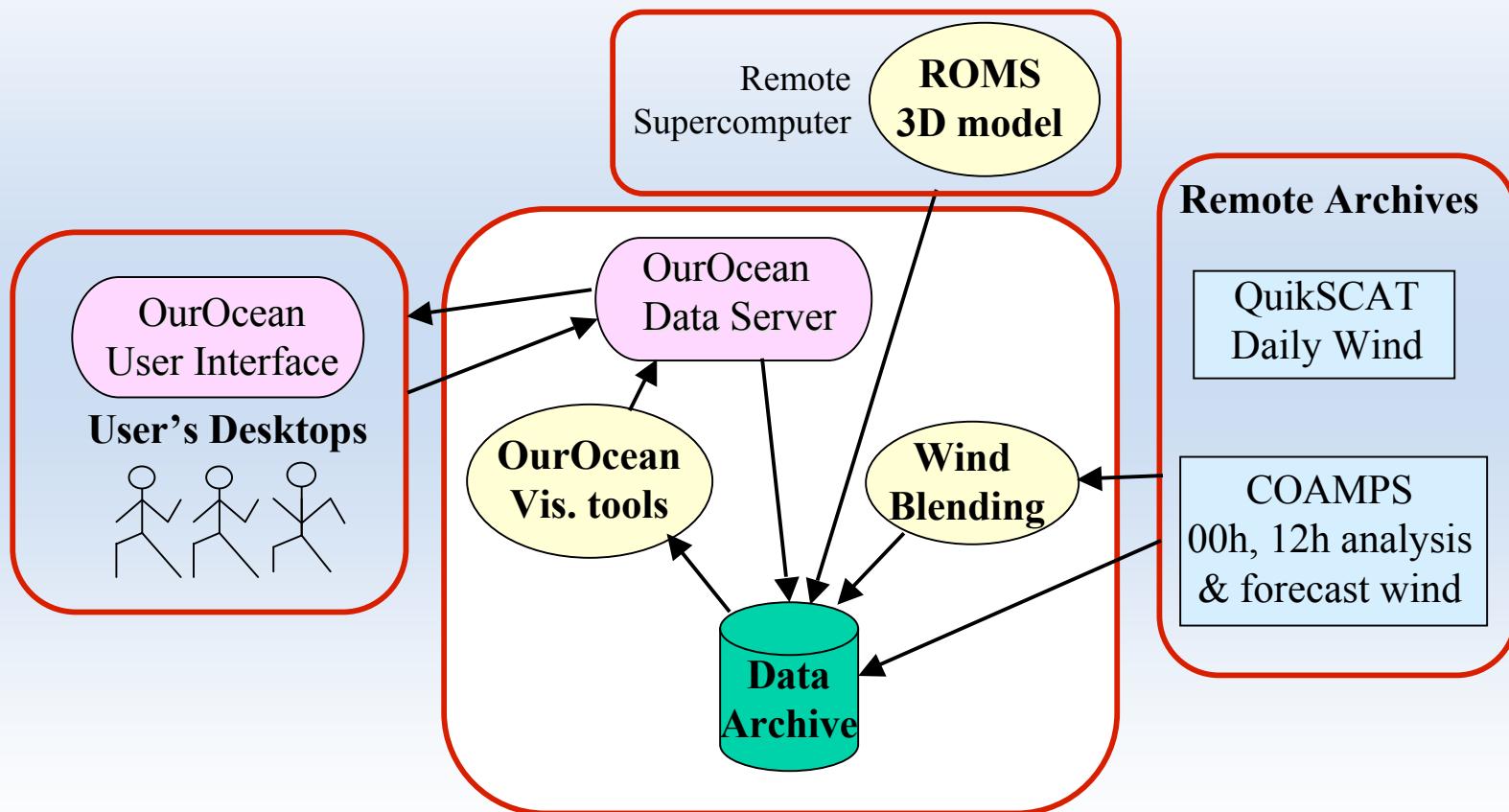


## OurOcean Architecture



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- An end-to-end web-based system for data retrieval, data archive, data processing and data distribution with a focus on the East Pacific Coastal Ocean wind.

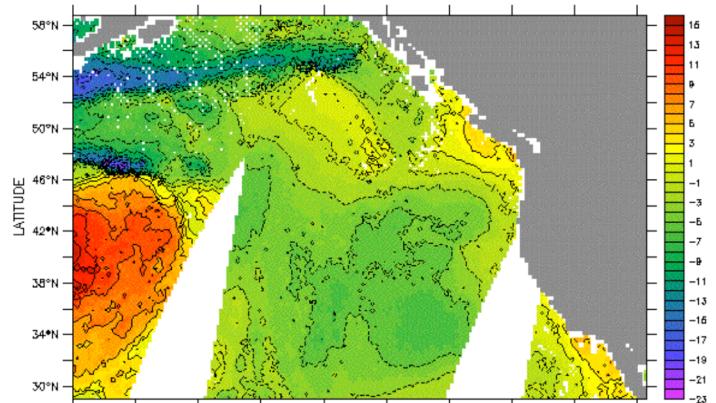




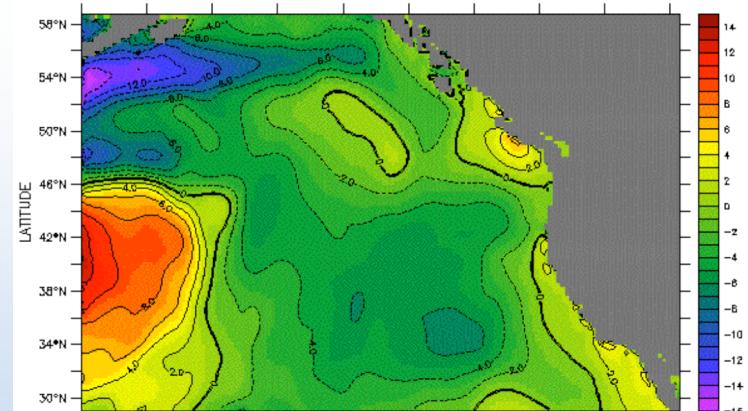
# OurOcean Data Products



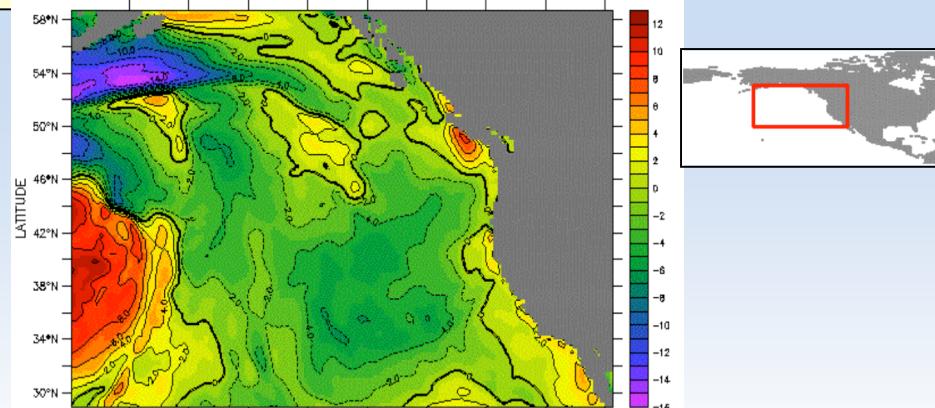
JPL



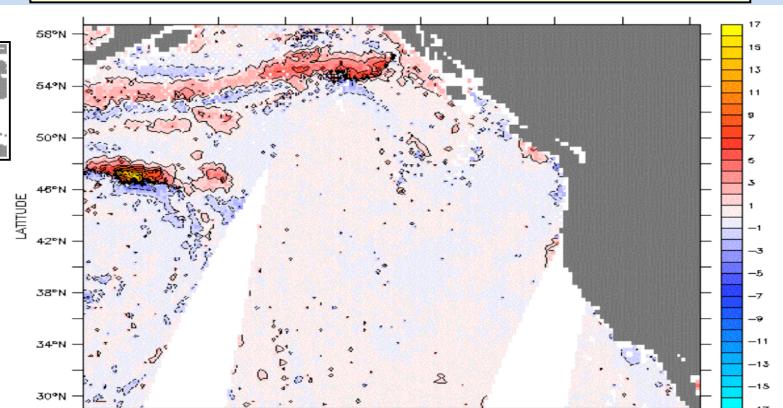
*The QuikSCAT wind,  $u$  component,  
descending pass, 9/21/2002*



*The blended wind data,  $u$  component,  
descending pass, 9/21/2002*



*The COAMPS wind,  $u$  analysis data  
at 00h, 9/21/2002*



*The comparison of the blended wind and the  
QuikSCAT data,  $u$  component, 9/21/2002*

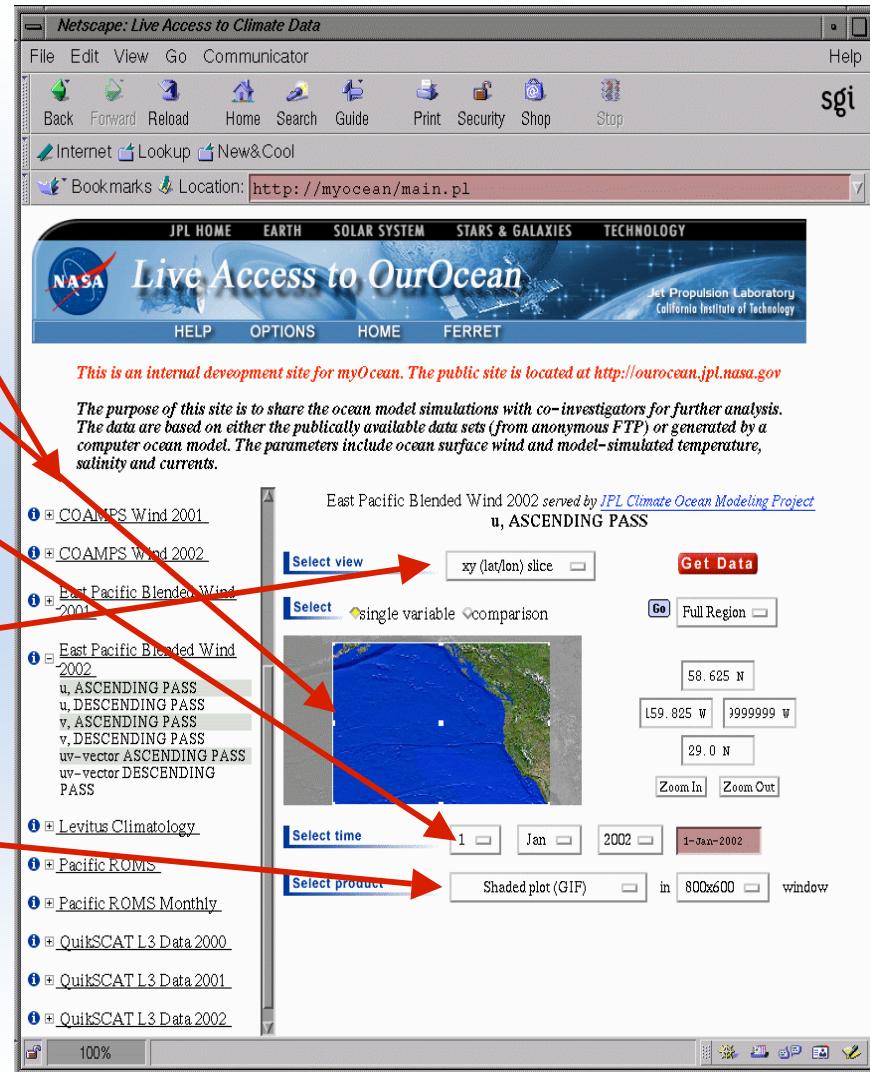


# OurOcean User Interface



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- Java applet enabled Web browser
- Multi-level selection of datasets
- Clickable and zoomable map to select a sub-area of the dataset
- Pull-down menu to select a subset in depth or time dimension
- 2D plots of cross sections of any two dimensions from a 2D, 3D, or 4D data set.
- Various output formats— images at different resolutions, raw data, NetCDF file, text data
- **Configurable user interface using XML metadata**





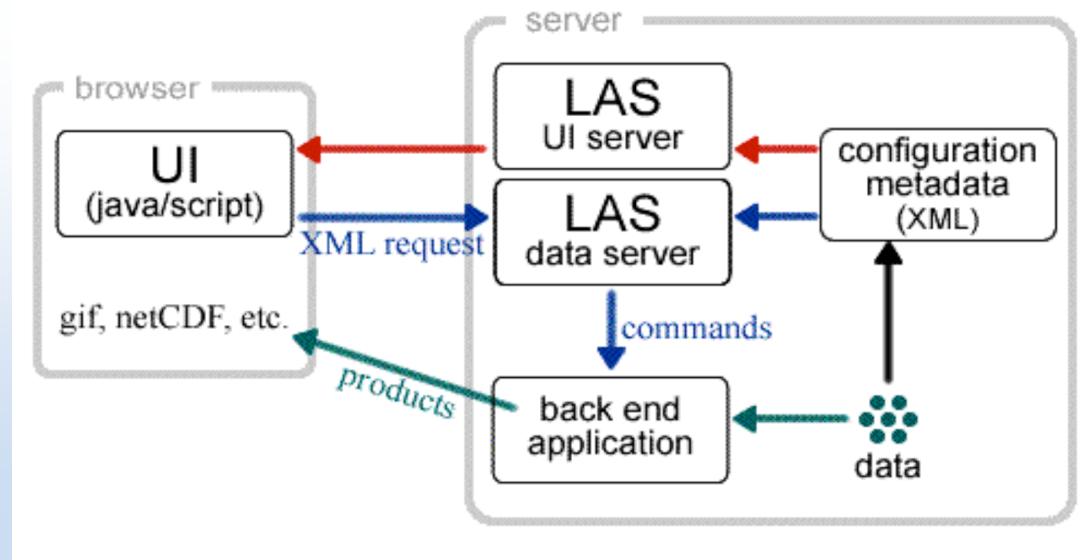
- Blended Wind Data Product (from QuikSCAT & COAMPS)
  - Two-dimensional variation data assimilation algorithm
  - Fill the missing data in QuikSCAT data set using the simulated wind.
  - Can be used as input to the real-time 3D regional ocean model
- ROMS (Regional Ocean Modeling System)
  - 3D Temperature, Salinity and Velocity Data
  - A parallel high-resolution 3D ocean modeling and forecasting system by UCLA/JPL
  - Using terrain-following curvilinear grids and good for modeling coastal oceans.



## OurOcean Data Server



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- Use re-configurable LAS (Live Access Server) developed by NOAA Pacific Marine Environmental Laboratory (PMEL) as the web server
- Data are stored in COARDS (Cooperative Ocean/Atmosphere Research Data Service) compliant NetCDF files, one file per year per data source
- Use XML to define the metadata for the datasets, the user interface, and the visualization tool options.
- Use Ferret data visualization and analysis system as the backend visualization tool.



# COARDS NetCDF Data Format



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## NetCDF (Network Common Data Form) -- Unidata

- A machine-independent format for representing scientific data
- An interface for array-oriented data access and a library to implement the interface

## COARDS NetCDF (Cooperative Ocean/Atmosphere Research Data Service) -- NOAA

- For sharing and distribution of global atmospheric and oceanographic data sets.
- Support rectilinear coordinate systems
- Support 1D, 2D, 3D, and 4D datasets

```
netcdf QuikSCATL3_2002
{
    dimensions:
        lat = 126 ;
        lon = 186 ;
        time = UNLIMITED ; // (295 currently)

    variables:
        float lat(lat) ;
            lat:long_name = "Latitude" ;
            lat:units = "degrees_north" ;
        float lon(lon) ;
            lon:long_name = "Longitude" ;
            lon:units = "degrees_east" ;
            lon:modulo = " " ;
        float time(time) ;
            time:long_name = "time" ;
            time:units = "days since 2002-01-
01" ;
            time:time_origin = "1-JAN-2002" ;
        float u_asc(time, lat, lon) ;
            u_asc:long_name = "u, ASCENDING
PASS" ;
            u_asc:units = "m/s" ;
            u_asc:scale_factor = 1. ;
            u_asc:add_offset = 0. ;
            u_asc:missing_value = 0. ;

    data:
        lat = 28.875,29.125,29.375,....
```





# XML Configuration File for Data Sets



```
<lasdata>
  <datasets>
    <QuikSCATL3_2002_nc url="file:/myocean/data/QuikSCAT/QuikSCATL3_2002.nc"
      name = "QuikSCAT L3 Data 2002" namedoc="">

      <variables>
        <u_asc units="m/s" name="u, ASCENDING PASS">
          <link match="/lasdata/grids/QuikSCATL3_2000_nc_lon_lat_time_grid"/>
        </u_asc>
      </variables>
    </QuikSCATL3_2002_nc>
  </dataset>
  <grids>
    <QuikSCATL3_2002_nc_lon_lat_time_grid>
      <link match="/lasdata/axes/QuikSCATL3_2002_nc_lon"/>
      <link match="/lasdata/axes/QuikSCATL3_2002_nc_lat"/>
      <link match="/lasdata/axes/QuikSCATL3_2002_nc_time"/>
    </QuikSCATL3_2002_nc_lon_lat_time_grid>
  </grids>
  <axes>
    <QuikSCATL3_2002_nc_lon units="degrees_east" type="x">
      <arange start="199.875" step="0.25" size="186"/>
    </QuikSCATL3_2002_nc_lon>
    <QuikSCATL3_2002_nc_time units="day" type="t">
      <arange start="2002-01-01 00:00:00" step="1" size="295"/>
    </QuikSCATL3_2002_nc_time>
  </axes>
</lasdata>
```





# XML Configuration File for User Interface



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```
<menu type="ops" name="Ops_Std2D">
    <item values="shade, shade">Shaded plot (GIF)</item>
    <item values="shade, ps">Shaded plot (PostScript)</item>
    <item values="data, txt">Quick inspection (text)</item>
    <item values="data, cdf">NetCDF</item>
    <item values="data, tsv">Tab separated (text)</item>
    <item values="data, csv">Comma separated (csv)</item>
    <item values="data, asc">FORTRAN formatted (text)</item>
    <item values="data, arc">ArcView gridded</item>
    <item values="ferret_script, jnl">Ferret script</item>
</menu>

<menu type="regions" name="Regions_Pacific">
    <item values="190, 252, 29, 60">Full Region</item>
</menu>

<menu type="views" name="Views_StdVec">
    <ifitem view="xy" values="xy">xy (lat/lon) slice</ifitem>
    <ifitem view="xz" values="xz">xz (lon/depth) slice</ifitem>
    <ifitem view="xt" values="xt">xt (Hovmoller) slice</ifitem>
    <ifitem view="yz" values="yz">yz (lat/depth) slice</ifitem>
    <ifitem view="yt" values="yt">yt (lat/time) slice</ifitem>
    <ifitem view="zt" values="zt">zt (depth/time) slice</ifitem>
</menu>

<image name="Image_Pacific" url="gifs/region.jpg" bounds="190, 252, 29, 60"/>
<map type="livemap" name="Regions_Pacific">
    <image href="#Image_Pacific"/>
    <menu href="#Regions_Pacific"/>
</map>
```

Customize  
Operations

Customize pre-  
defined regions

Customize  
views

Customize  
map image



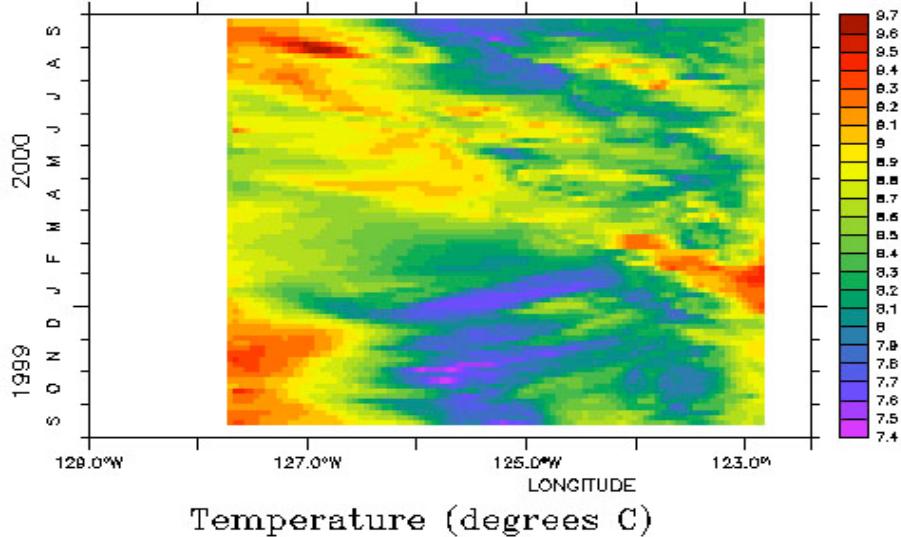


# OurOcean Visualization Tools

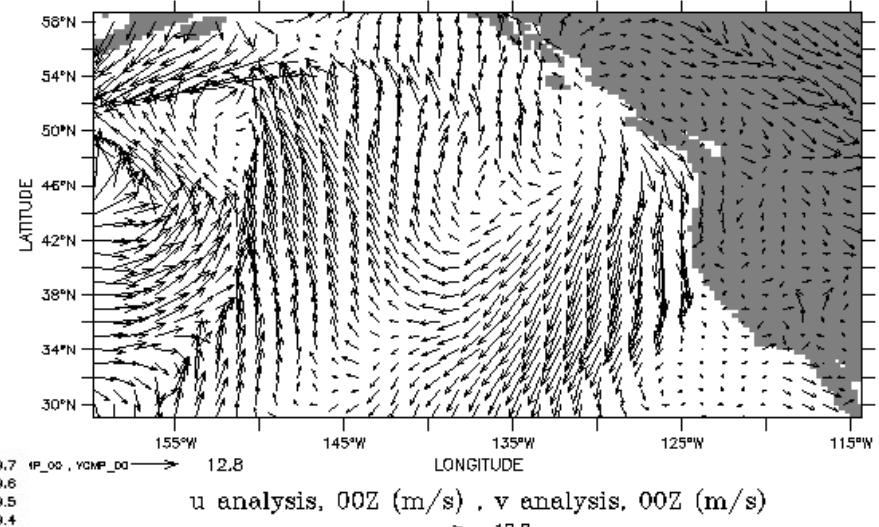


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- Ferret as default visualization tool  
2D plots of large 4D gridded data sets.
  - Shaded plots
  - Contour maps
  - Vector plots
  - Land shade



The temperature profile from 9/99 – 9/00 at 37.5° latitude,  
Data generated from a ROMS 3D model



Wind vector plot from COAMPS

- Customized visualization tools such as MatLab, IDL or other 3D vis. tools can be added.
- Capable of plotting compound variables (vectors) or difference of any two variables
- XML definition for plotting options



## Status & Future Direction



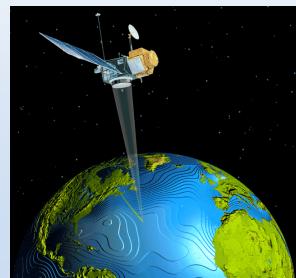
- *OurOcean* is serving 3 real time datasets (QuikSCAT, COAMPS, Blended Wind) and 3 ROMS datasets covering different regions (Atlantic, Central California Coastal and Pacific)
- *OurOcean* is currently open to selected collaborators outside JPL, will go public in December.
- Future plans:
  - Run East Pacific Coastal ROMS model on SGI Origin 2000 daily with the blended wind data as input, serve real time ROMS data on *OurOcean*
  - Add customized 3D visualization tool to *OurOcean*



# An End-to-End Ocean Forecasting System Integrating Observations, Model and Users

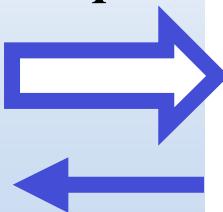


Observations  
(satellite, in situ)

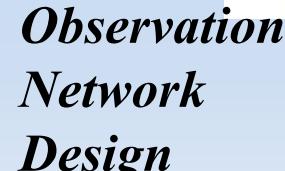


3-D Ocean  
Models  
(forward and inverse)

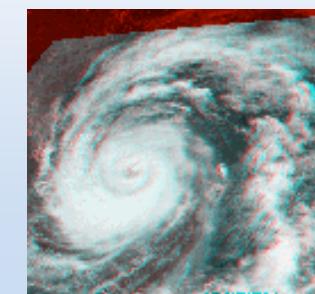
*Data  
Input*



*Observation  
Network  
Design*



*Synthesis  
Products*



User Community  
Local Managers  
Education  
Public Outreach



**OurOcean**